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Description injection system, pressure valve and flow rate regulating valve and method for regulating a fuel pressure the invention relates to an injection system for a burning prime mover < RTI ID=0.0> gemäss< /RTI> the generic term of the claim 1, a flow rate regulating valve and pressure valve in accordance with the claim 3 and a method seized for regulating egg of nes fuel pressure in a fuel memory in accordance with the generic term of the claim 7.

< RTI ID=0.0> Regelung< /RTI> the fuel pressure with a Kraftstoffspei more cher is in particular with a Common Rail system of Bedeu tung, since with a Common Rail system the maximum strength stoffdruck is for example at 1600 bar. Due to the high pressure it is favourable, the pressure in the strength material memory with < RTI ID=0.0> möglichst< /RTI> to regulate little power dissipation.

It is already a system for the regulation of the fuel pressure in a fuel memory known, with which the fuel pump always too much fuel to the fuel memory pumps and with < RTI ID=0.0> Überschreiten< /RTI> a given fuel pressure a pressure valve < itself; RTI ID=0.0> öffnet.< /RTI> This system exhibits however a relatively low efficiency.

Further it is known, to the improvement of the efficiency a flow rate regulating valve on the inlet side of the high pressure-pumps to plan and with the flow rate regulating valve the pressure in the fuel memory to regulate. Here it is however necessarily, < RTI ID=0.0> zusätzlich< /RTI> to plan a pressure valve at the fuel memory, which the pressure in the fuel memory quick sen ken can, which < for the example with; RTI ID=0.0> Übergang< /RTI> from full load on no-load operation enterprise is necessary. Besides is the pressure regulating valve

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required, in order to switch the fuel memory after the shutdown of the internal combustion engine pressureless.

Made of US 4.884.545 is a fuel injection system known, with which a fuel pump fuel < into a strength material memory; RTI ID=0.0> carried, < /RTI> der den Kraftstoff an Einspritzven- tile weiterleitet. In the inlet to the fuel pump a Vo lumen flow control valve is intended, which stops the fuel stream to the fuel pump. The flow rate regulating valve is < by a control unit; RTI ID=0.0> über< /RTI> an actuator controlled. At the strength material memory is intended a safety valve 13, with < RTI ID=0.0> Überschreiten< /RTI> a given pressure fuel from the fuel memory to the fuel tank to flow back leaves.

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In the after-published disclosure writing DE 196 12 413 A1 is fuel injection system a described, with which a fuel pump supplies a fuel memory with fuel, which < the fuel Einspritzventilen; RTI ID=0.0> zuführt.< /RTI> In the inlet to the fuel pump a flow rate regulating valve is intended, which becomes controlled of a control unit. The fuel memory stands with a pressure regulating valve in en connection, which is mechanical to the flow rate regulating valve GEC OI fur. The

mechanical coupling is in the manner ausgebil December that the pressure regulating valve is adjustable by the motion of the placing of member, which heads for the flow rate regulating valve from a closing position into a passage position, which < to a quick pressure relief of the Kraftstoffspei chers; RTI ID=0.0> führt.< /RTI>

The object of the invention is based to place a economical control of pressure for a fuel memory ready which exhibits an high efficiency at the same time.

The object of the invention is < by the features of on of saying; RTI ID=0.0> 1,3< /RTI> and 8 < RTI ID=0.0> gelöst.< /RTI> A substantial advantage of the he

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identification been based therein, < RTI ID=0.0> dass< /RTI> with a single regulating valve so probably the volume flow in the supply to the high-pressure pump and the pressure in the fuel memory regulated become.

Further favourable formations and improvements of the he identification are < in the dependent; RTI ID=0.0> Ansprüchen< /RTI> indicated.

The invention is < in the following on the basis the figures more near he; RTI ID=0.0> läutert< /RTI> ; show: Figure 1 an injection system with < RTI ID=0.0> erfindungsgemässen< /RTI> RH gel valve, figure 2 the schematic structure of the regulating valve, figure 3 a further embodiment of the regulating valve, figure 4 Haltedruck-und flow rate characteristic and figure 5 a prefered configuration of the regulating valve.

Figure 1 shows schematically the structure of an injection system, which < RTI ID=0.0> über< /RTI> one < RTI ID=0.0> Vorförderpumpe< /RTI> 2 aus einem Kraftstofftank 11 Kraftstoff <RTI ID=0.0>über</RTI> a regulating valve 10 of an high-pressure pump 1 < RTI ID=0.0> führt.< /RTI> The high-pressure pump 1 consolidates the supplied strength material and delivers under high pressure standing fuel into the fuel memory 4. The fuel memory 4 stands with Einspritzventilen 5 in connection, over which the strength becomes material into an engine injected. To the pre < RTI ID=0.0> förderpumpe< /RTI> 2 a form regulating valve 3 is parallel geschal tet, that after fuel pressure < RTI ID=0.0> Vorförderpumpe< /RTI> 2 to a given value adjusts.

The fuel memory 4 is < RTI ID=0.0> über< /RTI> one < RTI ID=0.0> Rückleitung< /RTI> 26 to the regulating valve 10 connected. The regulating valve 10 is besides 27 connected to a tank line, to the fuel tank 11 < RTI ID=0.0> geführt< /RTI> is. At the fuel memory 4 a pressure sensor 9 disposed, that is < RTI ID=0.0> über< /RTI> a signal line with a control unit 6 in connection stands. Besides a number of revolutions sensor is 8 and

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an accelerotor pedal sensor 7 intended, those likewise < RTI ID=0.0> über< /RTI> an SI gnalleitung to the control unit 6 connected are. The control unit 6 < RTI ID=0.0> verfügt< /RTI> < RTI ID=0.0> über< /RTI> a data memory 28 and is < RTI ID=0.0> über< /RTI> first control lines with the Einspritzventilen 5 and < RTI ID=0.0> über< /RTI> a second control line with the regulating valve 10 verbun that.

The arrangement after figure 1 functions as follows: The Steu < RTI ID=0.0> ergerät< /RTI> 6 steuert in Abhängigkeit von der Drehzahl der Brenn- kraftmaschine und dem Fahrerwunsch die <RTI ID=0.0>Einspritzventile</RTI> 5 nach einem entsprechenden Programm, das im Datenspeicher 28 abgelegt ist. Besides the control unit 6 steers the regulating valve 10 in < RTI ID=0.0> Abhängigkeit< /RTI> from the speed of the internal combustion engine and the fuel pressure in the fuel memory 4 and regulates thus the fuel pressure in the fuel memory 4.

Figure 2 shows schematically the structure of the regulating valve 10. Das Regelventil 10 weist einen Aktor 21 auf, der beispielsweise als Magnet ausgebildet ist. The actuator 21 is located to direct volume closing member 20 nem with egg in connection, which the fuel inlet 24, which < of; RTI ID=0.0> Vorförderpumpe< /RTI> 2 kommt, mit dem Kraft- stoffablauf 23, der zur Hochdruckpumpe 1 geführt ist, verbin- det. Besides the volume closing member 20 stands < RTI

ID=0.0> über< /RTI> a spring 12 with a pressure closing member 22 in connection, which < the en connection between; RTI ID=0.0> Rückleitung< /RTI> 26 and the tank line 27 with an adjustable retaining pressure locks.

In the quiescent position the connecting cross section between the fuel inlet 24 and the expiration of fuel is 23 by the volume closing member 20 closed and the connection zwi schen < RTI ID=0.0> Rückleitung< /RTI> 26 and the tank line 27 is < RTI ID=0.0> geöffnet.< /RTI>

Now if the control unit 6 heads for the magnet 21, then the volume closing member becomes 20 22 moved in the direction of the pressure closing member and thus the connecting cross section between the fuel inlet 24 and the expiration of fuel 23 < RTI ID=0.0> geöffnet.< /RTI>

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that one < RTI ID=0.0> über< /RTI> die Feder 12 das Druckschliessglied 22 gegen den <RTI ID=0.0>Öffnungsquerschnitt</RTI> < RTI ID=0.0> Rückleitung< /RTI> 26 prestressed. Preferred wise is the spring 12 in such a manner formed that in the Ruhepo sition < RTI ID=0.0> Druckschliessglied< /RTI> 22 < RTI ID=0.0> Rückleitung< /RTI> 26 releases and < RTI ID=0.0> Rückleitung< /RTI> 26 with the tank line 27 is connected.

Figure 3 shows a development of the regulating valve 10, with which the active compound between the volume closing member 20 and the pressure closing member 22 < RTI ID=0.0> über< /RTI> eine erste Koppelfeder 16 und eine zweite Koppelfeder 17 erreicht wird. The second ouple feather/ spring 17 is on a given spring action prestressed.

Now if the control unit 6 heads for the actuator 21, then the volume closing member becomes 20 moved and the volume flow, which flow to the high-pressure pump increased. Besides the pressure closing member 22 is < RTI ID=0.0> über< /RTI> the first ouple feather/spring 16 against < RTI ID=0.0> back < /RTI> line 26 prestressed. Now the first ouple feather/spring 16 is so far < RTI ID=0.0> squeezed together, < /RTI> that the biased spring action of the second ouple feather/ spring becomes 17 achieved, then first and the second ouple feather/spring 16.17 work in series connection with further moving of the volume closing member 20.

Figure 4 shows characteristics < RTI ID=0.0> für< /RTI> the retaining pressure P for would separate ne feather/spring couplings between the volume closing member and the pressure closing member in < RTI ID=0.0> Abhängigkeit< /RTI> from the shifting way S of the AC of gate 21 and in < RTI ID=0.0> Abhängigkeit< /RTI> of < RTI ID=0.0> Öffnungsquerschnitt< /RTI> Q, which volume closing member 20 up-steers. The retaining pressure P corresponds in each case to a closing force F. The deflection in the region larger as S1 corresponds to a volume flow < RTI ID=0.0> Q> 0.< /RTI> The rest position of the actuator 21 however preferably lies in the diagram with < RTI ID=0.0> s=0, < /RTI> whereby surely provided becomes, < RTI ID=0.0> dass< /RTI> in the rest position, D. h. in the unbestromten state of the actuator 21 the strength material memory pressureless connected is. With a deflection of the actuator 21 between 0 and Sl first the pressure closing member 22 develops a retaining pressure, before the Volu people letting member 20 the connecting cross section between that

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Fuel inlet 24 and expiration of fuel 23 with the first deflection Sl < RTI ID=0.0> öffnet.< /RTI>

The characteristic A corresponds to the regulating valve 10 of the figure 2, with which only a spring 12 between the volume closing member 20 is intended and the pressure closing member 22. The pressure, which becomes 22 adjusted of the pressure closing member, increases thereby linear with the deflection s of the actuator 21. Aus Figur 4 ist er- kennbar, dass das Volumenschliessglied 20 anfangs, <RTI ID=0.0>d.</RTI> h. for the deflection < RTI ID=0.0> s< Sl< /RTI> free travel puts back, in which the strength expiration of material is not connected with the fuel inlet yet. The pressure closing member 22 is < with the first deflection; RTI ID=0.0> S1, < /RTI> with that the volume closing member the connecting crosswise cut between the fuel inlet and the fuel derivative < RTI ID=0.0> opens, < /RTI> with a retaining force FO prestressed. The linear characteristic < the disadvantage; RTI ID=0.0> dass< /RTI> with large deflection s a large retaining force F constructed becomes.

The retaining pressure characteristic < RTI ID=0.0> für< /RTI> the regulating valve of the figure 3, with which first and a second ouple feather/spring are 16.17 between the volume closing member 20 and the pressure closing member 22 pre seen, is in the characteristic B shown. In the Ru heposition the first ouple feather/spring 16 relaxed and the second ouple feather/spring 17 < with the help of a stop 18 and one are; RTI ID=0.0> Übertragungsscheibe< /RTI> 19 prestressed. Is < also here; RTI ID=0.0> für< /RTI> the Vo lumen closing member 20 free travel intended, so that it < only; RTI ID=0.0> opens, < /RTI> if the pressure closing member 22 already with a Hal tekraft F1 against < RTI ID=0.0> Rückleitung< /RTI> 26 prestressed is. Now if the actuator 21 driven and the volume closing member 20 out directed become, then the retaining force rises, with which < RTI ID=0.0> Druckschliess < /RTI> member 22 prestressed becomes, linear up to a second out steering element S2 on. The linear increase corresponds to the spring rate of the first ouple feather/spring 16. Ab der zweiten Auslenkung S2 ist die erste Koppelfeder 16 derart gespannt, dass die Federkraft der ersten Koppelfeder 16 die Federkraft der vorgespannten

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second ouple feather/spring 17 achieved. As soon as the voltage of the he sten ouple feather/ spring 16 the biasing force of the second ouple feather/spring 17 < RTI ID=0.0> exceeds, < /RTI> < RTI ID=0.0> löst< /RTI> < itself; RTI ID=0.0> Übertragungsscheibe< /RTI> 19 of the stop 18 and the second ouple feather/spring 17 is likewise SAM-mix-pressed. Thus first and the second ouple feather/spring work 16.17 starting from the second deflection S2 in series connection.

Therefore breaks starting from the second deflection S2 the linear on rose the retaining force into a second, flatter linear on descended, which corresponds to a smaller spring rate. Starting from the second deflection S2 the retaining force, becomes 22 prestressed with which the pressure closing member, per deflection unit s increases smaller than < in the region between the deflection; RTI ID=0.0> s=0< /RTI> and the second deflection S2, D. h. die Federrate ist <RTI ID=0.0>kleiner</ RTI> < RTI ID=0.0> für< /RTI> s> S2.

In place of first and the second ouple feather/spring 16.17 if a spring, in particular a cup spring, is used which exhibits a degressive feather/spring characteristic, then results a Hal tekraft the pressure closing member 22 in < RTI ID=0.0> Abhängigkeit< /RTI> of the deflection of the magnet 21 the corresponding characteristic C of the figure 4. Due to the degressive feather/spring characteristic takes with small deflections after the quiescent position < RTI ID=0.0> s=0< /RTI> the retaining force of the pressure closing member 22 steeply too and goes in the region of the second deflection S2 into an almost horizontal course < RTI ID=0.0> über.< /RTI> With the first deflection S1 the cup spring exhibits a given retaining force F2.

By the degressive cup spring or by the two ouple 16.17 fits with springs, on the basis of the quiescent position with is < RTI ID=0.0> s=0< /RTI> a steep increase of the retaining force on the pressure closing member 22 achieved, that starting from, a second deflection given in advance S2 of the actuator 21 into a flat increase < RTI ID=0.0> übergeht.< /RTI> The knowing left B and C is < never; RTI ID=0.0> tatsächlichen< /RTI> Ratios of the strength of stoffdruckes in the fuel memory and the supplied Volu of menstromes to the fuel memory < RTI ID=0.0> angepasst.< / RTI> For a COMM on

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Rail system are already with small volume flows, D. h. with small amount at fuel, which becomes injected, and low engine speed high < RTI ID=0.0> Kraftstoffdrücke< /RTI> necessarily. Then with offers the characteristics B and C a good efficiency for the electrical drive, there < RTI ID=0.0> unnötig< /RTI> high < RTI ID=0.0> Haltekräfte< /RTI> with large deflections to be avoided. It is favourably, the spring with the degressive feather/spring characteristic so < RTI ID=0.0> to insert, < /RTI> that this in a given distance to < RTI ID=0.0> Volumenschliess < /RTI> member or pressure closing member disposed is, because thus a structure of a counter-pressure is avoided, if the pressure in the fuel memory < RTI ID=0.0> über< /RTI> das Druckschliessglied abgebaut wird.

< RTI ID=0.0> Kennlinienformen< /RTI> B, C offer further the advantage that in the region

between the quiescent position of the actuator 21 and the two ten deflection S2 a large < RTI ID=0.0> Änderung< /RTI> the retaining force of the pressure stop closing member 22 with simultaneous small Auslen kung the actuator 21 achieved becomes, whereby a simultaneous ge struggles < RTI ID=0.0> Änderung< /RTI> the deflection of the volume closing member 20 and thus with smaller < RTI ID=0.0> Änderung< /RTI> the volume flow made.

In this way small volume flows can do accurate einge place to become. This is from figure 4 apparent, since the pressure retaining strength F is a function, preferably proportional, from the control current I, with which the actuator 21 controlled becomes.

The volume flow Q is likewise preferably proportional to the deflection S.

Figure 5 shows a preferable embodiment of the Regelven tils 10 with a feather/spring combination corresponding figure 3. The regulating valve 10 exhibits a valve body 31, which is screwed in with a key attack 32 and a central thread 33 into a Stu fenbohrung a casing 34. The housing 34 is preferably the housing of an high-pressure pump. In the Ge live to 34 is an inlet drilling 35, a sequence hole 36, a high pressure inlet drilling 38 and a Hochdruckablaufboh rung 37 introduced. To the inlet drilling 35 is the strength

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material inlet 24, to which sequence hole 36 is the fuel off run 23, to which high pressure inlet drilling is 38 < RTI ID=0.0> Rückleitung< /RTI> 26 and to the high pressure sequence hole 37 is the tank line 27 connected. The inlet drilling 35, which is sequence hole 36 and the high pressure sequence hole 37 preferably as RA diale ports formed and < RTI ID=0.0> münden< /RTI> in one ent speaking first annular channel 39, second annular channel 40 and third annular channel 41. In represented the example the first annular channel 39 and the second annular channel 40 by axial transferred diameter stages in the housing 34 result and in the Ven < RTI ID=0.0> tilkörper< /RTI> 31. The third annular channel 41 is 31 introduced as circumferential groove into the valve body. The provided regulating valve 10 darge in figure 5 is generally cylinder-symmetric 71 formed to the axis of symmetry.

Between the first annular channel 39 and the central thread 33 a first seal ring is 42, between the first annular channel 39 and the second annular channel 40 is a second seal ring 43 and between the second annular channel 40 and the third annular channel 41 is a third seal ring 44 into the valve housing 31 in brought. First man second and the third seal ring 42, 43.44 are formed as radially sealing O-rings.

Into the valve body 31 a first connecting hole 55, a second connecting hole 57 and a third verb in dung drilling 64 on the basis of first, is second and the third annular channel 39.40.41 introduced. First, second and the third connecting hole 55.57.64 connect first, second and the third annular channel 39.40.41 with a central bore 70, who < symmetric to the Symme tri axle 71 and in; RTI ID=0.0> Längsrichtung< /RTI> the valve body 31 into the valve body 31 introduced is. In the central bore 70 a rule slidegate valve 53 in brought to the axis of symmetry 71, which < as, is parallel; RTI ID=0.0> Hülse< /RTI> formed is. Besides a closing pin 51 is intended, that within the rule slidegate valve 53

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symmetric and in < RTI ID=0.0> Längsrichtung< /RTI> to the axis of symmetry arranges 71 ange is. The closing pin 51 and the rule slidegate valve 53 are into the central bore 70 fitted and in < RTI ID=0.0> Längsrichtung< /RTI> the central bore 70 adjustably disposed. The Regelschie more ber 53 points one < RTI ID=0.0> ringförmig< /RTI> circumferential and to < RTI ID=0.0> Ventilkör < /RTI> by 31 open annular space 54 up, which is in the quiescent position of the rule slidegate valve 53 only with the first inlet drilling 35 verbun that. Wird der Regelschieber 53 von dem Elektromagneten 72 in die Arbeitsposition bewegt, so wird <RTI ID=0.0>über</RTI> the annular space 54 the first inlet drilling 35 connected with the first sequence hole 36. Auf diese Weise wird der Volumenstrom, der der Hochdruckpumpe 1 <RTI ID=0.0>zugeführt</RTI> becomes, controlled.

To the axis of symmetry 71 and at the lower end the rule of valve 10 the high pressure inlet drilling

38 introduced is centric.

The central bore 70 is < in the lower region by; RTI ID=0.0> Kopfstück< /RTI> 45 completed, with one < at the same time; RTI ID=0.0> conclusion < /RTI> piece into the high pressure inlet drilling 38 rises up. < RTI ID=0.0> Kopfstück< /RTI> 45 71 disposed are centric and exhibit centrically a pressure drain drilling 48 to the axis of symmetry. The pressure drain drilling 48 wei tet itself in the direction of the central bore 70 into a ke < RTI ID=0.0> gelförmigen< /RTI> Valve seat up, is 50 disposed in which a ball, which becomes 48 held of a receptacle 52 on the pressure drain drilling. The receptacle 52 forms the lower end of the closing pin 51. Between < RTI ID=0.0> Kopfstück< /RTI> 45 and the rule slidegate valve 53 circumferential is < around the closing pin 51 an annular space 63 formed, to the high pressure sequence hole 37; RTI ID=0.0> über< /RTI> the third connecting hole 64 connected is.

< RTI ID=0.0> zylinderförmige< /RTI> Continuation < RTI ID=0.0> Kopfstückes< /RTI> 45, which rises up into the high pressure inlet 38, is < of one; RTI ID=0.0> ringförmigen< /RTI> < RTI ID=0.0> Stützring< /RTI> 47 and a seal ring 46 surround, which seal the high pressure inlet drilling 38.

By a corresponding movement of the closing pin 51 the ball becomes 50 with a corresponding retaining force F beauf

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strike, so that the pressure drain drilling becomes 48 only released ones if the pressure is larger in the pressure drain drilling 48 as the retaining force F. Auf diese Weise wird die Verbindung zwischen dem Hochdruckzulauf 38 und dem Hochdruckablauf 37 gesteuert. The closing pin 51 with the ball 50 represents a pressure closing member 22 the corresponding figures 2 and 3.

The seal ring 46 and < RTI ID=0.0> Stützring< /RTI> 47 offers the advantage that no axial contact pressure < RTI ID=0.0> benötigt< /RTI> will, in order to seal run drilling 38. The axial contact pressure < RTI ID=0.0> müsste< /RTI> zwi schen < RTI ID=0.0> Kopfstück< /RTI> 45 and the central thread 33 of the valve < RTI ID=0.0> gehäuse< /RTI> 31 received become, if as seal example finds a wise metallic flat seat or Kegelsitz or a cutting ring use < RTI ID=0.0> würde. < /RTI>

In the upper region of the regulating valve 10 an electromagnet is 72 with a magnet coil 73 and an assigned anchor guide rod 58 disposed, which is centric 80 guided to the axis of symmetry 71 in a guide sleeve. < RTI ID=0.0> Ankerführungs < /RTI> bar 58 rises up into the central bore 70 and is < RTI ID=0.0> über< /RTI> a second ouple feather/spring 17 with the rule slidegate valve 53 in effect verb in dung. The second ouple feather/spring 17 is < by one; RTI ID=0.0> transmission < /RTI> buchse 60 vorgespannt, wobei die <RTI ID=0.0>Übertragungsbuchse</RTI> 60 at egg of ner abutment surface 62 of the rule slidegate valve 53 and the second ouple feather/spring 17 against a stop sleeve rests upon 74 links up, as < RTI ID=0.0> Endstück< /RTI> the anchor guide rod 58 formed is.

< RTI ID=0.0> Ubertragungsbuchse< /RTI> adjacent retainer ring 75 formed to the stop 62 one perpendicularly to the axis of symmetry 71 exhibits 60, that with a conclusion socket 76, which represents the upper END piece of the rule slidegate valve 53, a case-like second feather/spring area 77 trains, which becomes 74 limited toward the electrical magnets 72 of the stop sleeve. On impact case 74 76 fixed are connected with the conclusion socket.

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This connection takes up the biasing force of the second ouple feather/spring 17.

Die <RTI ID=0.0>Übertragungsbuchse</RTI> 60 is < on the side; RTI ID=0.0> Elektromagne < /RTI> ten with an end plate 87 completed. Into the over carrying socket 60 rises up the closing pin 51, which < with one; RTI ID=0.0> Übertragungsplatte< /RTI> , ent those locks 78 a plug speaking the plug < RTI ID=0.0> Übertragungsbuchse< /RTI> 60 exhibits.

The end plate 78 is centrically 71 ange to the axis of symmetry arranges and perpendicularly to the axis of symmetry 71 and into the over carrying socket 60 disposed movable inside. Between < RTI

ID=0.0> Übertragungsplatte< /RTI> 78 and the end plate 87 is a he ste ouple feather/spring 16 introduced.

In the quiescent position the anchor guide rod 58 with egg of ner stopper plate 79 rests against a stop 66 of the magnet housing 81. Preferably the stop 66 is for example < RTI ID=0.0> über< /RTI> Setting shims corresponding more adjustable. The armature 82 is < RTI ID=0.0> über< /RTI> a further sheet 85 and the stopper plate 79 on the anchor guide rod 58 adjust.

The closing pin 51 is not in the quiescent position 50 prestressed against the ball. Thus the pressure drain drilling is 48 in the quiescent position, D. h. without drive electromagnets 72 < RTI ID=0.0> geöffnet.< /RTI> The rule slidegate valve 53 is in the quiescent position so disposed that the inlet drilling is 35 with the annular space 54 en federations. The sequence hole 36 is not connected however with the annular space 54.

Now if the electromagnet becomes 72 driven of a final stage, so moved the actuator guide rod 58 in the direction of the closing pin 51 and is passed thereby < RTI ID=0.0> über< /RTI> the second Kop more pelfeder 17 and the first ouple feather/spring 16 one < RTI ID=0.0> höhere< /RTI> Pressure holding strength on the ball 50. The pressure retaining strength F takes left

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near mit der Auslenkung S der Aktuatorführungsstange 58 zu, wie in Figur 4 dargestellt ist.

Simultaneous one becomes the rule slidegate valve 53 direct of the Aktua torstange 58 in the direction of the second connecting hole 57 pushed. As soon as the tax edge 56 of the annular space 54 the second connecting hole 57 achieved flows, a volume river from the inlet drilling 35 for sequence hole 36. Thus the volume flow becomes the high-pressure pump 1 controlled.

Preferably the second connecting hole 57 exhibits the form of a rectangular lengthwise slot, which becomes in motion direction of the rule slidegate valve 53 extended, so that the off nungsquerschnitt direct proportional to the way S is, with which the rule slidegate valve 53 moved. A further favourable form is more triangular < RTI ID=0.0> Öffnungsquerschnitt.< /RTI> The Regelschie more ber 53 represents a volume closing member 20 the corresponding Fi guren to 2 and 3.

Now if the actuator guide rod becomes 58 up to the second out steering element S2 moved, then the first ouple feather/spring is SAM-mix-pressed 16 so far that the spring action of the first ouple feather/spring 16 is the same spring action of the second, prestressed ouple feather/spring 17. Thus now with a further deflection the AC tuatorführungsstange 58 is squeezed together both the first ouple feather/spring 16 and the second ouple feather/spring 17.

In the region between the deflection 0 and the second Auslen kung S2 moved < itself; RTI ID=0.0> Übertragungsbuchse< /RTI> 60 common with the stop sleeve 74 and the rule slidegate valve 53. Starting from the second deflection S2 moved < itself; RTI ID=0.0> Übertragungsbuchse< /RTI> 60 in < RTI ID=0.0> Kräf < /RTI> tegleichgewicht the second ouple feather/spring 17 and the first ouple feather/spring 16 opposite the stop sleeve 74 < RTI ID=0.0> Ankerfüh < /RTI> rungsstange 58. In this way the increase of the holding strength F the ball breaks 50 starting from the second deflection S2 into one

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smaller increase per deflection unit s off, as is 4 apparent from figure.

The high pressure inlet drilling 38 is connected only then with the high pressure sequence hole 37, if a larger pressure of the high pressure inlet drilling affects the ball 50, when the ball affects 50 by the retaining force F of the closing pin 51.

With exception of the annular space 54 are < RTI ID=0.0> sämtliche< /RTI> <RTI ID=0.0>Räume</RTI> within the regulating valve by not represented slots and bores connected with the annular space 63, over with a displacement of the individual parts one < RTI ID=0.0> Verdrängung< /RTI> to make possible the fuel.

Anstelle der zwei Koppelfedern 16,17 kann auch eine degressive Feder zwischen der

Ankerführungsstange 58 und dem Schliessstift 51 eingesetzt werden. In this way a pressure retaining characteristic the corresponding characteristic C of the figure 4 is < RTI ID=0.0> ermöglicht.< /RTI>